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INDOOR ORNAMENTAL PLANTS AND THEIR ANTIMICROBIAL PROPERTIES

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ABSTRACT

Indoor plants are often considered as ornamental plants. Most of the plants have antimicrobial properties to survive from pathogenic organisms. On the contrary, the volatile substances secreted by the indoor plants are capable of controlling the humidity in the closed room conditions, thus preventing the microbial propagation and survival. The current study is aimed at finding the antimicrobial tendencies of selected indoor plants by agar well diffusion method. The methanolic extracts of *Diffebranchia spp*s & *Cordyline spp*s found to be controlling different microbial species. Results indicated predominant control of *Staphylococcus aureus* and *Saccharomyces cerevisiae* by the former plant and *Corynebacterium diphtheriae* by latter.

INTRODUCTION

Plants are one of the ancient sources of medicine. Phytal extracts of different plants are used in ayurvedic medical treatment in different parts of India. Plants have a unique protecting mechanism from external environment by producing secondary metabolites likes alkaloids, saponins, tannins, flavanols, sterols etc. These act as immune barrier by inhibiting the growth or activity of foreign material. Plants have gained prominence as ornamental plants to decorate interiors of homes and gardens. Earlier studies indicated that plants which grow in low light conditions of indoors can be effective in removal of commonly found indoor air polluting chemicals and airborne microbes. Control of microbes could be due to volatile substances emitted by house plants such as *Dieffenbachia Camille*, *Philodendron domesticum*, *Codiaeum variegatus* and *Cyperus alternifolius* (Wolverton and Wolverton, 1996). *Dieffenbachia* spp and *Cordyline* spp, the most commonly used indoor ornamental plants, easily available, slow growing and propagate by vegetative means have been chosen to study their antimicrobial activity. These plants belong to family *Araceae* and *Asparagaceae* respectively. *Dieffenbachia* spp. plant is also known as Dumb Cane as it affects the vocal cord thus making an individual temporarily dumb when the leaves are eaten. *Cordyline* spp., also known as Ti plant are found in different colour shades from green to burgundy, survive in all climates. The leaves of the plant are used for ornamental purpose and offerings to the Gods in Hawaii (Kawate et.al.,2014). The current study is aimed at assessing the antibacterial and antifungal activity of the methanolic and aqueous leaf extracts.

MATERIALS AND METHODS

Sample collection and preparation of extract

Dieffenbachia species & *Cordyline* species plant leaves were considered for the study. Leaves were procured from Sanjay Gandhi National Park, Borivali (west), Mumbai and were identified and verified by Dr. Sasirekha of Botany Department of Mithibai College for the taxonomic consideration.

Plants leaves were air dried under shade for 5 days. The leaves were crushed using mortar and pestle. 50ml of 80% methanol / distilled water were added to the approx.5gm of leaves. The mixture was heated in boiling water bath at 50 °C for 10 min. The extract was filtered through muslin cloth and referred as DME (*Dieffenbachia* methanol extract), DWE (*Dieffenbachia* water extract), CME (*Cordyline* methanol extract) and CWE (*Cordyline* water extract) could be used for assessing its anti fungal and anti bacterial activity.

Bacterial species such as *Staphylococcus aureus*, *Corynebacterium diphtheriae*, *Klebsiella pneumonia* and *Escherichia coli* were considered along with fungal species such as *Saccharomyces cerevisiae* for the studies.

ANTIMICROBIAL ASSAY

The agar well diffusion method (Perez et.al.,1990) whose modified version adopted earlier was used (Ahmad and Aquil 2007). 0.1 ml of inoculums (10^5 CFU/ml) of selected bacterial test organisms was spread on MH/ NA agar plates; and fungal species such as *Saccharomyces cerevisiae* on Sabouraud Agar plates using a sterile cotton swab in order to obtain uniform microbial growth. Wells of 8mm diameter were punched into the agar medium. 25µl of each extract (50mg/1ml concentration) was dispensed into the cup using micro-pipette fixed with sterile tips. Distilled water/ 80% methanol were used as negative controls. The plates were incubated for 18 h at RT/37°C. The antibacterial activity was evaluated by measuring the diameter of inhibition zones in mm (NCCLS, 2002) Experiments were carried out in triplicate and the averages diameters of zone of inhibition were recorded.

RESULTS

The methanol and distilled water extracts of both the ornamental plants showed control on *C.diphtheriae* (>11mm). *S aureus* was sensitive against DME, CME and CWE while resistant against DWE. Other bacterial species such as *Escherischia coli* and *Klebsiella pneumoniae* found to be resistant irrespective of the extraction solvent for both the indoor plants. Most common fungus *Saccharomyces cerviseae* was found to be effectively controlled by CME than others.

The methanolic extractions of *Dieffenbachia* showed control over *C.diphtherae* and *S aureus*, however, the aqueous extractions had no control over *S.aureus*. Similarly, *Cordyline*'s methanol and aqueous extracts had control over *C.diphtherae* and *S aureus* but bacterial species such as *E.coli* and *K pheumoniae* showed strong resistance. The common phyto chemicals of these plants are carbohydrates and phenols. The other phytochemicals observed were glycosides (*Cordyline spp*s) and, tannins and alkaloids (*Dieffenbachia spp*s). Earlier studies indicated that the methanolic extraction of *Cordyline terminalis(fruticosa)* found to be having better antibacterial activity than that of n-hexane and, acetone and choloroform . A moderate anitbacterial activity (>11mm) was shown by methanolic extracts against *E.coli*, *Shigella boydii*, *Streptococcus pyogenes* and *Staphylococcus epidermis* where the disc contained the 500µg concentration of the crude material (Firoj et.al.,2003).

Table.1: Antimicrobial activity of *Dieffenbachia* spp & *Cordyline* spp leaf extracts

Organisms	D.M.E	D.W.E	C.M.E	C.W.E
<i>Corynebacterium diphtheriae</i>	12 mm	11.5 mm	11 mm	16 mm
<i>Staphylococcus aureus</i>	13 mm	R	12 mm	13 mm
<i>Escherichia coli</i>	R	R	R	R
<i>Klebsiella pneumoniae</i>	R	R	R	R
<i>Sachcharomyces cerevisiae</i>	13 mm	9mm	14.5 mm	11 mm

[Key: DME (*Dieffenbachia* methanol extract), DWE (*Dieffenbachia* water extract), CME (*Cordyline* methanol extract) and CWE (*Cordyline* water extract)]

DISCUSSION AND CONCLUSION

House plants are capable of emitting the volatile substances such as terpenes, and phenolic compounds which are known as allelochemicals (Weaver and Klarich,1977). These chemicals directly or indirectly can suppress the growth of airborne microbes, can keep the indoor atmosphere germ free. The methanolic extracts of House plants (*Dieffenbachia* and *Cordyline* spp)also have potential to control the growth of bacteria such as *C.diphtherae* and *S.aureus* and fungal species of *S.cerviceae*. Further studies are required to assess the importance of indoor plants in drug development against the bacterial and fungal species.

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